troubleshooting guide

INTEGRATED CONTROL MOTOR (ICM2)

Cancels: New

TI 557A-48-1
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CONTENTS

	Page
GENERAL	1
COMPONENT DESCRIPTION	1-5
ICM2 Selection Modes	1
SEQUENCE OF OPERATION	5
I. Continuous Fan Operation	5
II. Cooling Mode, 557A and 657A Units	5
III. Cooling Mode, 658A and 589A Units	5
IV. Heating Mode, 658A and 589A Units	5
V. Electric Heat Mode	5
VI. Heat Pump, Heating with Auxiliary Heat	5
VII. ICM2 Control Power	5
VIII. Low-Voltage Circuit Fusing	5
IX. Motor Power Connections	5
OPERATING PROBLEMS	5-7
I. Fan Will Not Turn On from Thermostat	5
II. Fan Will Turn On, but Electric Heat Stages Will Not	6
III. Easy Select Board Fuse Keeps Blowing	6
IV. Motor Does Not Run	7
V. Motor Shaft Does Not Rotate Smoothly	7
VI. Motor Does Not Run Smoothly	7
VII. Motor Does Not Stop Running	7
TROUBLESHOOTING SUMMARY	8-16

GENERAL

This manual contains information to assist in troubleshooting operating problems and errors associated with the Integrated Control Motor (ICM2). The ICM2 is used in the units listed in Table 1.

Table 1 — Units With ICM2

UNIT	UNIT SIZE
557A	048,060
589A	048,060
657A	048,060
658A	048,060

⚠ **WARNING:** Before performing service or repair operations on unit, turn off main unit power. Electrical shock could cause personal injury.

COMPONENT DESCRIPTION

The ICM2 (Fig. 1) is powered with high voltage at all times. It is pre-programmed and contains airflows for all modes of operation.

The ICM2 reacts to changes in system static pressures to maintain constant airflow. The blower delivers requested airflow up to about 0.7 in. of static pressure.

The ICM2 will not operate with high voltage alone; low voltage must be applied to the control plug for the motor to run. The ICM2 is first fed high voltage through the 5-pin connector. As this occurs, the AC power is rectified to DC by a diode module. After rectification, the DC signal is electronically communicated and fed in sequential order to stator windings. The frequency of communication pulses determines motor speed. The rotor is permanently magnetized.

The ICM2 interfaces with the Easy Select Board (Fig. 2 and 3). Setting up desired system airflow is accomplished through selections made on the Easy Select Board. Power for the system is supplied from a 230-vac, 60 Hz line. A class 2 voltage (24 vac nominal) transformer is used for thermostat connections. The transformer is located either in, or below, the main unit control box, depending on the unit. The secondary (SEC) side of the transformer is connected to the control box. The 24-vac secondary circuit includes a socket, soldered into the circuit at SEC2, to receive a 5-amp automotive-type fuse.

ICM2 SELECTION MODES

Connections to the thermostat are made at leads connected through P1 of the Easy Select Board. Eighteen 0.187-in. quick-connect terminals comprise the field select taps, which provide programming selection for ICM2. Wiring for the 5 selection modes is listed in Table 2.

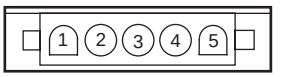
Table 2 — ICM2 Selection Mode Wiring

MODE	WIRE COLOR
AUX Heat Range	Violet
AC/HP Size	Blue
Type	Orange
AC/HP CFM Adjust	Black
AC/HP Time Delay	Gray

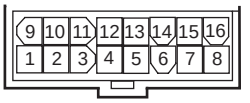
LEGEND

AC — Air Conditioning
HP — Heat Pump

The 557A, 589A, 657A and 658A units are factory-set to operate properly with system components. See Fig. 4 for factory default settings. To reconfigure a basic system, refer to information printed on the circuit board next to select pins, and to base unit installation instructions. Move the 5 selection wires to match the components used.



POWER CONNECTOR



CONTROL CONNECTOR

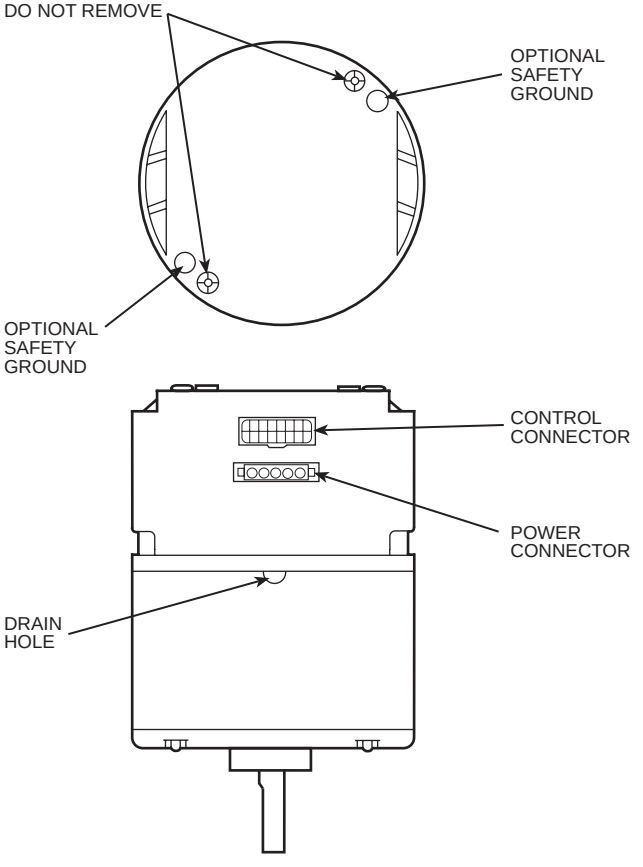


Fig. 1 — Integrated Control Motor 2

A. AUX HEAT RANGE

Airflow for 658A and 589A units is a preset factory selection. The airflow selection must not be set lower than the default. Refer to Table 3 for the allowable airflows.

Airflow for 657A, 557A units requires the installer to select the auxiliary heat airflow that best suits the installation. Refer to installation instructions for electric heaters. See Table 3 for available airflow.

Each select pin is configured for a certain airflow. The airflow will be supplied in the emergency heat mode, which is the heating mode on units with electric heat as the primary heating source.

For heat pump units, the ICM2 will run whichever is higher; heat pump airflow or electric heat airflow. The preset factory default selection is the highest airflow. This helps ensure safe heater operation.

Table 3 — Allowable Airflows for AUX HEAT

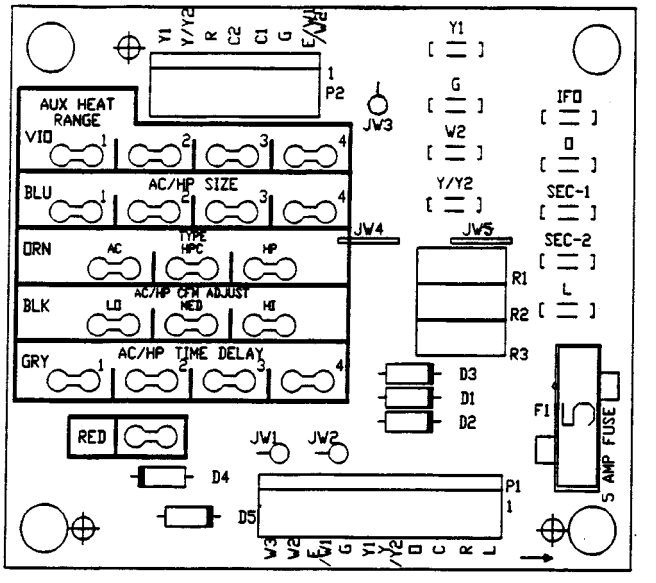
AUX HEAT	EASY SELECT BOARD TERMINAL			
	1	2	3	4
Cfm	1300	1400	1600	1700
Gas Heat Input Size (Btuh)				
80,000	X	X	X	X
100,000		X	X	X
120,000			X	X
140,000				X
Electric Heater Package (5-10 kW)	X	X	X	X

B. AC/HP SIZE

The preset factory default selection for AC/HP Size is 400 cfm per ton. The selection pins are configured for 350 cfm per ton at terminals 1 and 3, and 400 cfm per ton at terminals 2 and 4.

C. TYPE

The type is a preset factory default selection. The factory setting is AC for 589A and 557A units. For 658A units, the factory setting is AC. For 657A units the factory setting is HP. The HPC provides the same airflow as the AC selection.



LEGEND

IFO — Indoor (Evaporator) Fan On
JW — Jumper Wire

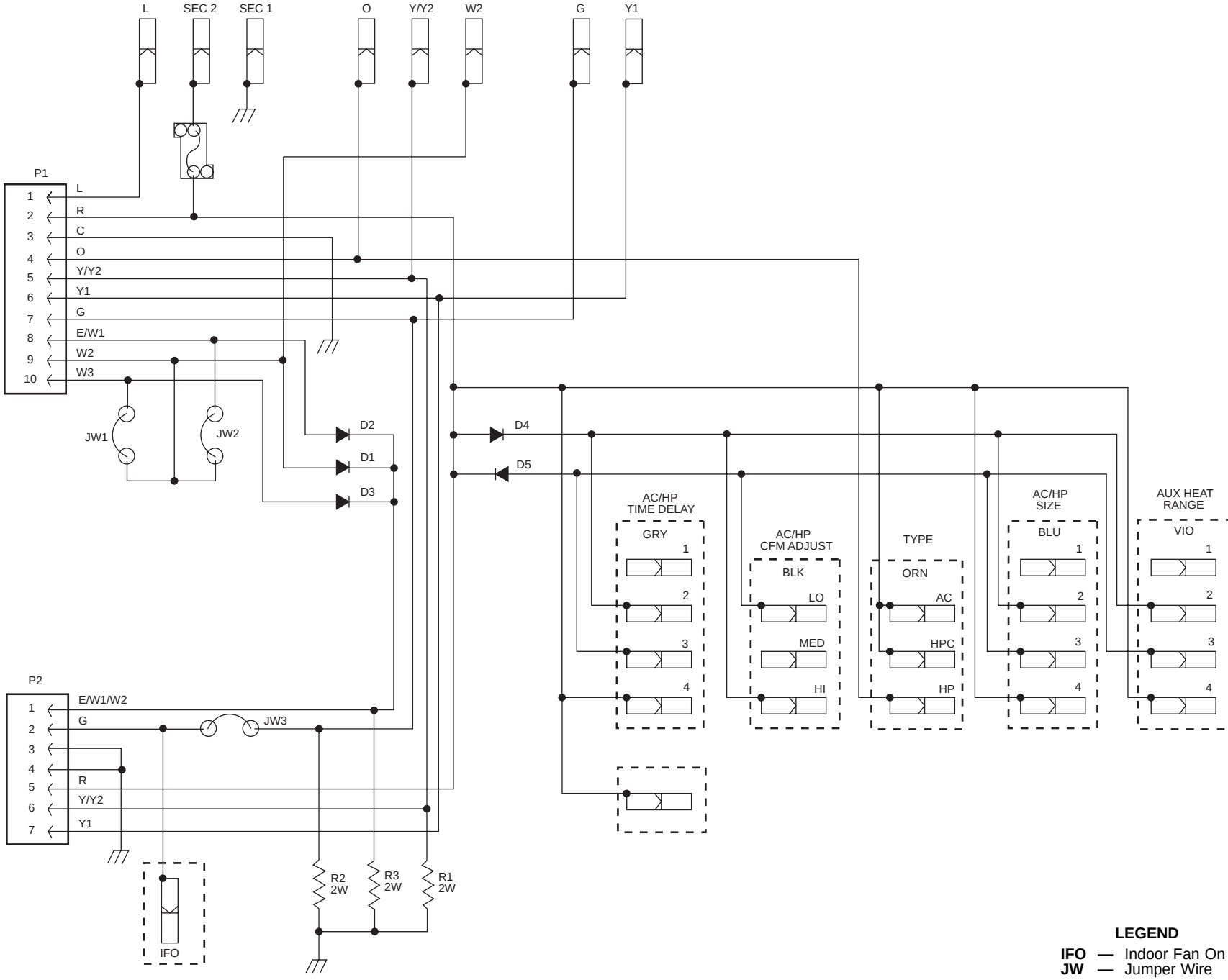
Fig. 2 — Easy Select Board

D. AC/HP CFM ADJUST

The preset factory default selection is MED. Selections HI and LO will adjust the airflow supplied for all operation modes. Refer to Table 4. The selection options are provided for the installer to meet individual installation needs (static compensation, noise, etc.).

Table 4 — Airflow Percentage Difference From Nominal (MED Setting)

MODE	FAN ONLY	COOLING	HEATING	HEAT PUMP
LO ADJUST	−15%	−12.5%	−15%	−10%
HI ADJUST	15%	12.5%	15%	10%



LEGEND

IFO — Indoor Fan On
JW — Jumper Wire

Fig. 3 — Easy Select Board Circuitry

589A, 658A MODELS

VIO	AUX. HEAT RANGE			
	1	2	3	4
	1300	1400	1600	**1750**
BLU	AC/HP SIZE			
	1	2	3	4
	1400	**1600**	1750	**2000**
ORN	TYPE			
	AC	HPC	HP	
BLK	AC/HP CFM ADJUST			
	LO	**MED**	HI	
GRY	AC/HP TIME DELAY			
	1	2	3	4
	30 sec ON/ 60 sec OFF	**0 sec ON/ 0 sec OFF**	0 sec ON/ 30 sec OFF	0 sec ON/ 45 sec OFF

557A MODELS

VIO	AUX. HEAT RANGE			
	1	2	3	4
	1300	1400	1600	**1750**
BLU	AC/HP SIZE			
	1	2	3	4
	1400	**1600**	1750	**2000**
ORN	TYPE			
	AC	HPC	HP	
BLK	AC/HP CFM ADJUST			
	LO	**MED**	HI	
GRY	AC/HP TIME DELAY			
	1	2	3	4
	30 sec ON/ 60 sec OFF	0 sec ON/ 0 sec OFF	**0 sec ON/ 30 sec OFF**	0 sec ON/ 45 sec OFF

657A MODELS

VIO	AUX. HEAT RANGE			
	1	2	3	4
	1300	1400	1600	**1750**
BLU	AC/HP SIZE			
	1	2	3	4
	1400	**1600**	1750	**2000**
ORN	TYPE			
	AC	HPC	**HP**	
BLK	AC/HP CFM ADJUST			
	LO	**MED**	HI	
GRY	AC/HP TIME DELAY			
	1	2	3	4
	30 sec ON/ 60 sec OFF	0 sec ON/ 0 sec OFF	**0 sec ON/ 30 sec OFF**	0 sec ON/ 45 sec OFF

FACTORY DEFAULT SETTING

NOTE: The AC/HP SIZE setting is Terminal 2 for size 048 and Terminal 4 for size 060.

Fig. 4 — Factory Default Settings

E. AC/HP TIME DELAY

Four motor operation delay profiles are provided to customize and enhance system operation. These selections include an option for no delays, which may be used during service procedures. When other components, such as Integrated Gas Control (IGC), are used to perform the delay function the preset factory default setting is terminal 2 for 658A and 589A units.

Also available is a 30-second ON/60-second OFF delay profile at terminal 1. This profile may be used to allow system coils time to heat or cool, and may minimize some cold blow in heat pump operation.

A 30-second OFF delay at terminal 3 and a 45-second OFF delay at terminal 4 are optional.

SEQUENCE OF OPERATION

I. CONTINUOUS FAN OPERATION

The thermostat closes circuit R to G. The G signal is sent directly to ICM2.

II. COOLING MODE, 557A AND 657A UNITS

The thermostat closes circuit R to G, R to Y/Y2, R to O, and R to Y1 (heat pump only) for single speed. The Y/Y2 signal is sent directly to ICM2. On heat pump units, Y1 signal is also sent directly to ICM2.

III. COOLING MODE, 658A AND 589A UNITS

Thermostat closes, closing circuits from R to G, R to Y1, R to Y2 and O (658A units only). All but the G signal are sent to ICM2 directly. The G signal is not sent directly because the JW3 jumper is cut to prevent feedback in heating mode. The G signal is sent to the Integrated Gas Control (IGC) board, where the indoor fan contacts closes and energize the IFO (Indoor Fan On) terminal. It is then sent to the ICM2 directly.

IV. HEATING MODE, 658A AND 589A UNITS

A. 658A Units

For heat pumps, the thermostat closes, closing circuits R to G, R to Y1 and R to Y/Y2. Y1 and Y/Y2 are sent to ICM2 directly. The IGC board sends the G signal to ICM2 through the IFO terminal.

B. 589A Units

Thermostat closes, closing circuit from R to W1. Signal is sent to both the IGC board and the ICM2. When the indoor fan contacts close on the IGC board, a 24-volt signal is sent to ICM2 through the IFO terminal.

V. ELECTRIC HEAT MODE

Thermostat closes circuit R to W2, W3, or E. The terminal block positions W2, W3 and E are tied together by jumpers JW1 and JW2. These jumpers are provided for future flexibility staging of electric heater banks. When staging is a requirement, the installer must cut jumpers and wires in thermostats, following common procedure and practice. The 3 electric heater inputs are also interlocked through diodes D1, D2, and D3 to motor input W.

VI. HEAT PUMP, HEATING WITH AUXILIARY HEAT

Thermostat closes circuits R to Y/Y2 and R to Y1, with R to W2, W3 or E (and R to O in case of defrost). In the event that electric heating is called for by the thermostat while heat pump is operating in heat or defrost mode, the electric heating signal will appear at motor connector pin 1. If necessary, the motor will modify airflow output to provide an airflow that is safe for operation of electric heater.

VII. ICM2 CONTROL POWER

The ICM2 control power is supplied for R circuit through runs to motor control connector pin 5, then through motor control harness to motor. The C side of low voltage control power circuit is connected by printed circuit runs to motor connector pins 3 and 4, then through motor control harness to motor.

VIII. LOW-VOLTAGE CIRCUIT FUSING

Low-voltage circuit is fused by a board-mounted 5-amp automotive-type fuse placed in series with transformer SEC2 and R circuit. The C circuit of transformer is referenced to chassis ground through a printed-circuit run at SEC1, connected to a metal standoff marked 'Ground Screw Required.' A ground screw must be in place or erratic motor operation may result.

IX. MOTOR POWER CONNECTIONS

The high-voltage 230-vac power input to the Easy Select Board is provided through line side of contactor to plug 4 of motor. High voltage terminals are 4 and 5. Terminal 3 is ground connection.

OPERATING PROBLEMS

⚠ **WARNING:** Turn off all power to unit before performing any service procedure to avoid the possibility of electric shock and personal injury.

I. FAN WILL NOT TURN ON FROM THERMOSTAT

This may indicate a problem with high voltage connections. Perform the following checks:

1. Check power leads L1 and L2. If L1 and L2 are not receiving power the system cannot function.
2. Check 5-pin connector at motor for 230 volts, or check for continuity.
3. Check the low-voltage transformer leads. Be sure they are wired correctly.
4. Check output voltage of transformer secondary side SEC1 and SEC2. Ensure transformer output is approximately 24 vac. If transformer output is 0 vac and the transformer is receiving correct input voltage (208 v or 240 v), then the transformer must be replaced.

If the transformer output is 24 vac, check the Easy Select Board voltage as follows:

Check low-voltage fuse (Fig. 2). If fuse is blown, replace it. The transformer cannot supply power to the Easy Select Board with a loose or blown fuse.

If the fuse blows when the unit has power supplied to it, the system likely has one of the following problems:

- Electrical short or miswiring. Check control circuit.
- Transformer load exceeding maximum of 40 va. If the load is excessive, the low-voltage 5-amp fuse will blow to protect the transformer. Check relays for excessive current draw.

Refer to Tables 5 and 6 for Easy Select Board male/female quick connect terminals and connections.

II. FAN WILL TURN ON, BUT ELECTRIC HEAT STATES WILL NOT

Perform the following checks:

1. Check relay wirings, fuses to electric heaters (if applicable), and voltage to relay. All relays numbered one receive a 24-vac signal. If the correct voltage is being received, check if relay is closing. If the relay is not closing, relay must be replaced.
2. Check for blown diodes. If diodes are blown it is likely that a plug is miswired. Easy Select Board must be replaced if diode is bad.
3. Check if traces on back of Easy Select Board are overheated. If traces are overheated, there likely has been a high-voltage short, or high-voltage has been applied to a low-voltage circuit. This can be prevented by ensuring the Easy Select Board has been correctly wired prior to applying power.

III. EAST SELECT BOARD FUSE KEEPS BLOWING

When the low-voltage fuse blows, it is likely that the transformer would have blown had the low-voltage fuse not been in circuit to protect it. The fuse usually blows when there is high current drawn on the transformer, high-voltage applied to the low-voltage circuit, or a direct secondary short.

When there is high current drawn on the transformer, it is most likely because the transformer has been shorted or the system is drawing more va than the transformer rating allows. When fuse blows because of high voltage, the system has mixed high and low voltage signals.Perform the following checks:

1. Check transformer, thermostat and control box wiring.
2. Check to be sure low-voltage and high-voltage wiring are connected to proper terminals.
3. Check va draw on transformer. If va draw is more than va rating of the transformer, fuse will blow. Transformer must be replaced with one that has a higher va rating.

Table 5 — Male/Female Quick Connect Terminals

FEMALE CONNECTION SIZE	MALE CONNECTION	UNITS 557A, 589A, 657A, 658A
0.25 x 0.032	Y/Y2	High and single speed
	Y1	Low speed compressor
	SEC1	Secondary connection from transformer (24 vac). This connection is common to chassis ground through eyelet marked GROUND SCREW REQUIRED.
	SEC2	Secondary connection from transformer (24 vac)
	IFO	Indoor Fan ON terminal
	O	4-Way valve
	AUX1	Low voltage ground for auxiliary option (24 vac)
	AUX2	Low voltage output for auxiliary option (24 vac)
0.187 x 0.032	G	Indoor Fan
	RED	Common to R screw terminal and SEC2
	L	This connection is a field termination for use in connection leads (L) of thermostat. There is no connection of this terminal with control circuitry.

Table 6 — Connections and Connector

TYPE CONNECTION	TYPE CONNECTOR	PIN NO.	DESCRIPTION
Thermostat Connection	10-Pin Header	Pin 1	L — This connection is a field termination for use in connecting leads (L) of thermostat. There is no connection of this terminal with control circuitry.
		Pin 2	R — Connection for R signal to thermostat (24 vac)
		Pin 3	C — Connection for C terminal to thermostat (24 vac common)
		Pin 4	O — Connection for O signal from thermostat
		Pin 5	Y/Y2 — Connection for Y signal from thermostat
		Pin 6	Y1 — Connection for low-speed compressor operation
		Pin 7	G — Connection for G signal from thermostat
		Pin 8	E/W1 — Connection for E signal from thermostat/W1 on Gas Heat
		Pin 9	W2 — Connection for W2 signal from thermostat
		Pin 10	W3 — Connection for W3 signal from outdoor thermostat
Integrated Control Motor 2	7-Pin Header	Pin 1	Diode OR output of E/W1 or W3 or W2 thermostat signals
		Pin 2	Thermostat G signal
		Pin 3	Common to C, SEC1, and chassis ground
		Pin 4	Common to C, SEC1, and chassis ground
		Pin 5	Common to R and SEC2 (via 5-amp fuse)
		Pin 6	Thermostat Y/Y2 signal
		Pin 7	Thermostat Y1 signal

IV. MOTOR DOES NOT RUN

Perform the following checks:

1. Check all plugs and receptacles on ICM2 circuit board and motor for bad connections. Be sure all plugs are fully seated.
2. Verify that there are approximately 230 v at terminals of contactor. If not, determine if high-voltage is entering the unit.
3. Verify that there is a low-voltage control signal to the motor. The motor receives control signals through the 7-pin motor plug P2. The voltage output of each pin in the plug will be different, depending on mode or operation. Table 7 lists voltage present in each pin of 7-pin plug for each operating mode. Testing should be done between the points listed in Table 7, and the common C screw terminal. If all the values of any one of the operating modes check out, and the motor still fails to run, it is likely the motor is defective and will need replacement.

V. MOTOR SHAFT DOES NOT ROTATE SMOOTHLY

The motor shaft normally does not run smoothly. This is due to steps in rotation, called motor cogging. The cogging is caused by permanent magnets passing each pole in the motor. However, the shaft should not require excessive force to turn. If shaft is very difficult to turn, motor control or bearings have failed and the motor must be replaced.

VI. MOTOR DOES NOT RUN SMOOTHLY

Perform the following check:

Check blower wheel for damage and determine if blower wheel is out of balance. If it is not defective, the motor will likely need replacement.

VII. MOTOR DOES NOT STOP RUNNING

Perform the following checks:

1. Check for good ground between motor ground lead, transformer common lead, and control board. If this does not stop the motor, continue to Step 2.
2. Remove all thermostat wiring. If this makes the motor stop, it means the circuit board is faulty and must be replaced. If it does not stop, continue to Step 3.
3. Remove the 7-pin plug. If motor still runs, replace motor.

Table 7 — Motor Control Test Values

OPERATING MODE		SCREW TERMINALS HAVING 24 VAC					VOLTAGES — 7-PIN PLUG P2						
							W Pin 1	G Pin 2	C Pin 3	C Pin 4	R Pin 5	Y/Y2 Pin 6	Y Pin 7
Electric	**Heating**	R	W2	W3*	E*		24 vac	0	0	0	24 vac	0	0
1-Speed AC	**Cooling**	R	Y/Y2	G			0	24 vac	0	0	24 vac	24 vac	0
2-Speed AC, Low Speed	**Cooling**	R	Y1	G			0	24 vac	0	0	24 vac	0	24 vac
2-Speed AC, High Speed	**Cooling**	R	Y/Y2	G			0	24 vac	0	0	24 vac	24 vac	0
1-Speed HP	**Cooling**	R	Y/Y2	G	O		0	24 vac	0	0	24 vac	24 vac	0
1-Speed HP	**Heating**	R	Y/Y2	G			0	24 vac	0	0	24 vac	24 vac	0
2-Speed HP, Low Speed	**Cooling**	R	Y1	G	O		0	24 vac	0	0	24 vac	0	24 vac
2-Speed HP, Low Speed	**Heating**	R	Y1	G			0	24 vac	0	0	24 vac	0	24 vac
2-Speed HP, High Speed	**Cooling**	R	Y/Y2	Y1	G	O	0	24 vac	0	0	24 vac	24 vac	24 vac
2-Speed HP, High Speed	**Heating**	R	Y/Y2	Y1	G		0	24 vac	0	0	24 vac	24 vac	24 vac
Continous Fan		R	G				0	24 vac	0	0	24 vac	0	0

LEGEND

AC — Air Conditioning
HP — Heat Pump

*Pin 1 has 24 vac with or without jumpers whenever any individual heater input or any combination of heater inputs are energized.

TROUBLESHOOTING SUMMARY

Use Table 8 and Fig. 5-12 in troubleshooting.

Table 8 — Troubleshooting Summary

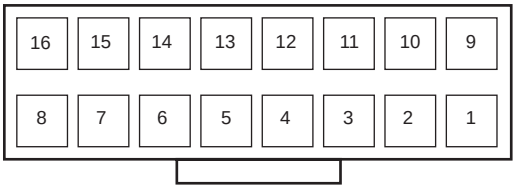
SYMPTOM	CAUSE	REMEDY
Motor runs in some operation modes, but not in others.	Poor connection between components	Check wiring harness connectors (see Note 1).
		Check for a good ground connection between motor ground lead and circuit board screw.
		Check thermostat connections (Note 2).
Circuit board will not operate.	Burnt components	Check for burn traces or burnt components. If present, replace circuit board.
	Blown fuse	Check 5-amp fuse.
	Blown transformer	Check for 24v between SEC1 and SEC2. If no voltage present, check transformer.
Motor is hard to turn manually.	Motor control or bearing failure	Replace motor.
Motor does not stop running.	Faulty circuit board, thermostat	Test circuit board by removing 7-pin plug from circuit board. If motor stops, it is a problem with the circuit board or thermostat. Test thermostat by disconnecting it from circuit board.
	Faulty motor	If motor fails to stop running once 7-pin plug is removed from circuit board, replace motor.
Motor does not operate.	Burnt components	Replace motor and verify that drip loop is present on connection wires.

LEGEND

SEC — Secondary

NOTES:

1. To check wiring harness, shut off power to unit. Remove 5-pin plug from motor. **Never remove 5-pin plug from motor with power on.** Check for 24v between pin-1 and pin-12 on the 16-pin plug. If no voltage is present, replace wiring harness. If voltage is present, jumper terminals R-Y/Y2 on circuit board and check for 24v between pin-12 and pin-14 and pin-16 (see below).



16-PIN PLUG

2. To check thermostat, remove thermostat wires from circuit board. Jumper screw terminals one at a time as follows: R-G, R-Y/Y2, R-Y1 and R-W2 to check connections.

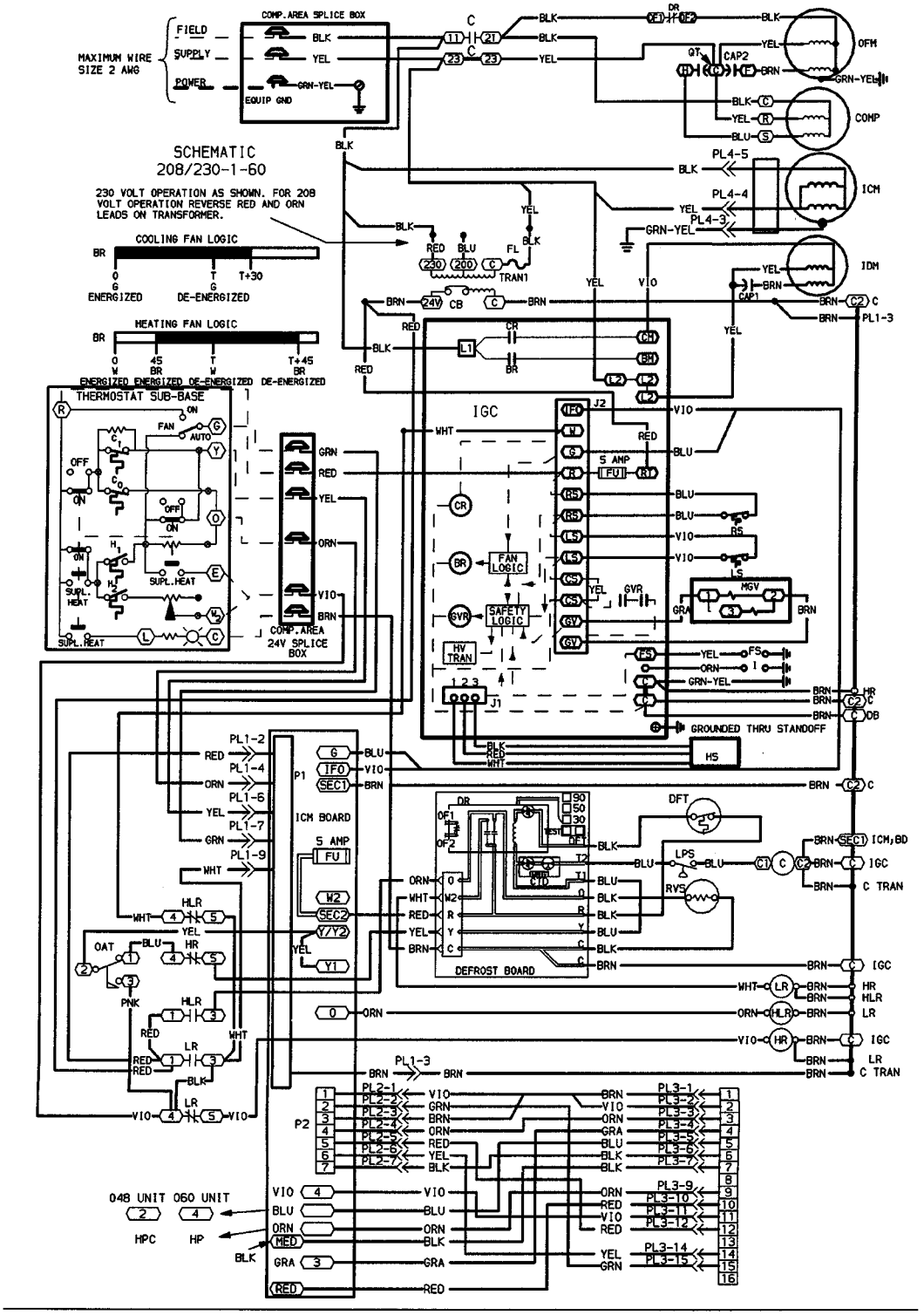


Fig. 5 — Wiring Diagram, Units 658A048,060; 208/230-1-60

LEGEND

AWG	—	American Wire Gage
BR	—	Blower Relay
C	—	Contactor, Compressor
CAP	—	Capacitor
CB	—	Circuit Breaker
COMP	—	Compressor Motor
CR	—	Compressor Relay
CTD	—	Compressor Time Delay
DB	—	Defrost Board
DFT	—	Defrost Thermostat
DR	—	Defrost Relay
EQUIP	—	Equipment
FL	—	Fuse Link
FS	—	Flame Sensor
FU	—	Fuse
GND	—	Ground
GVR	—	Gas Valve Relay
HLR	—	Heater Lockout Relay
HR	—	Heater Relay (Strip Heat)
HS	—	Hall Effect Sensor
HV TRAN	—	High-Voltage Transformer
I	—	Ignitor
ICM	—	Integrated Control Motor
IDM	—	Induced-Draft Motor
IFM	—	Indoor-Fan Motor
IFO	—	Indoor-Fan On
IGC	—	Integrated Gas Control
LPS	—	Low-Pressure Switch
LR	—	Lockout Relay
LS	—	Limit Switch
MGV	—	Main Gas Valve
OAT	—	Outdoor-Air Thermostat
OFM	—	Outdoor-Fan Motor
QT	—	Quadruple Terminal
RS	—	Rollout Switch
RVS	—	Reversing Valve Solenoid
SEC	—	Secondary
TRAN	—	Transformer

Field Splice

Marked Wire

Terminal (Marked)

Terminal (Unmarked)

Terminal Block

Splice

Splice (Marked)

Factory Wiring

Field Control Wiring

Field Power Wiring

Accessory or Optional Wiring

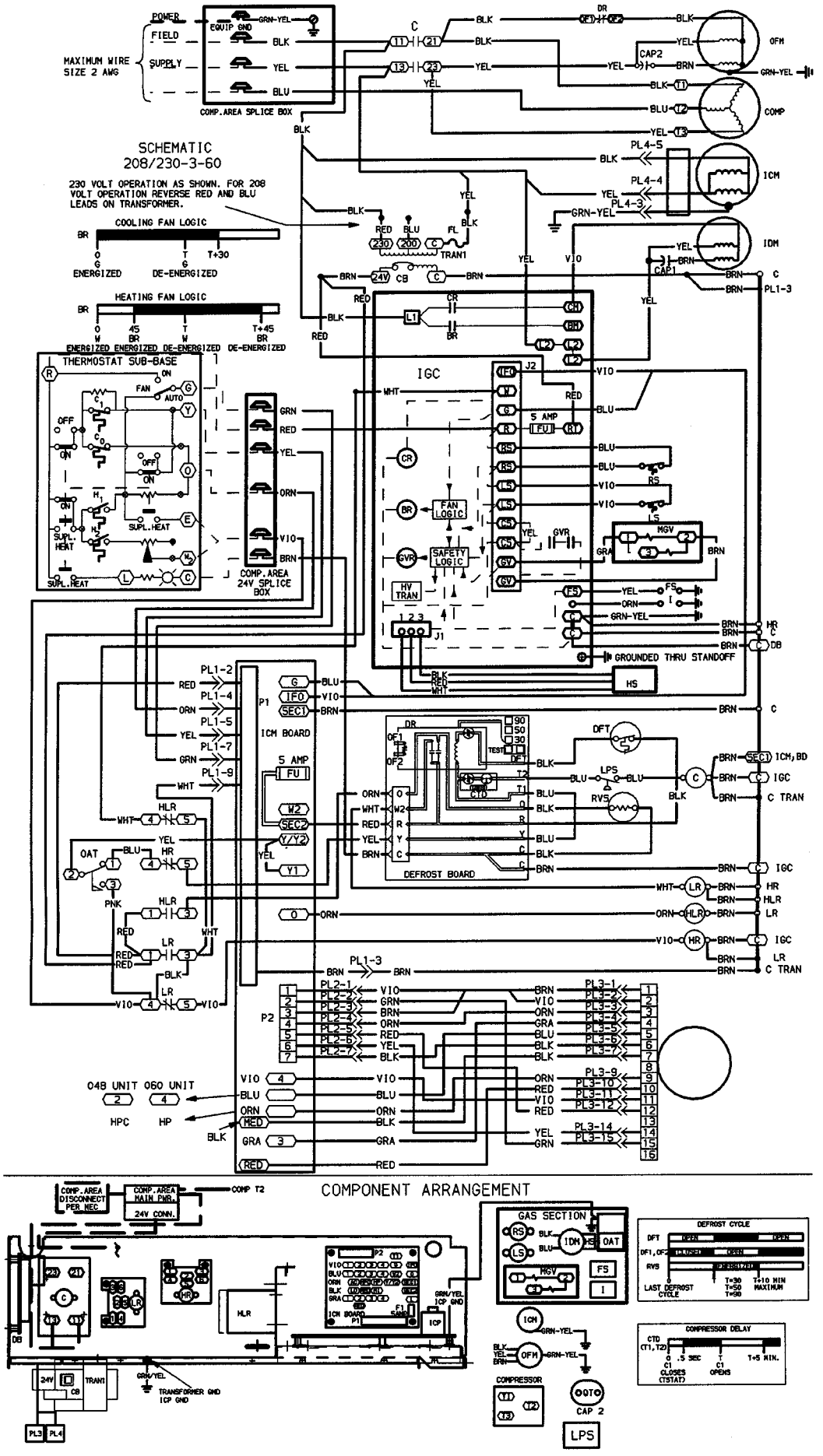
To Indicate Common Potential Only, Not to Represent Wiring

NOTES:
1. If any of the original wire furnished must be replaced, it must be replaced with type 90 C wire or its equivalent.
2. Set heat anticipator at .6.
3. Use copper conductors only.
4. ICM board connections.

UNIT 658A	TERMINAL NO. 1	2	3	4
	CFM			
(VIO) Aux, Heat Range	1300	1400	1600	1750
(BLU) AC/HP Size	1400	1600	1750	2000
(GRY) AC/HP Time Delay	30 sec. ON 1 min. OFF	0 sec. ON 0 sec. OFF	0 sec. ON 30 sec. OFF	0 sec. ON 45 sec. OFF

LED INDICATIONS

ERROR MODE	LED INDICATION
Normal Operation	ON
Hardware Failure	OFF
Fan ON/OFF Delay Modified	1 FLASH
Limit Switch Fault	2 FLASH
Flame Sense Fault	3 FLASH
5 Consecutive Limit Switch Faults	4 FLASH
Ignition Lockout Fault	5 FLASH
Inducer Switch Fault	6 FLASH
Rollout Switch Fault	7 FLASH
Internal Control Fault	8 FLASH



LEGEND

AWG	—	American Wire Gage
BR	—	Blower Relay
C	—	Contactor, Compressor
CAP	—	Capacitor
CB	—	Circuit Breaker
COMP	—	Compressor Motor
CR	—	Compressor Relay
CTD	—	Compressor Time Delay
DB	—	Defrost Board
DFT	—	Defrost Thermostat
DR	—	Defrost Relay
EQUIP	—	Equipment
FL	—	Fuse Link
FS	—	Flame Sensor
FU	—	Fuse
GND	—	Ground
GVR	—	Gas Valve Relay
HLR	—	Heater Lockout Relay
HR	—	Heater Relay (Strip Heat)
HS	—	Hall Effect Sensor
HV TRAN	—	High-Voltage Transformer
I	—	Ignitor
ICM	—	Integrated Control Motor
IDM	—	Induced-Draft Motor
IFM	—	Indoor-Fan Motor
IFO	—	Indoor-Fan On
IGC	—	Integrated Gas Control
IP	—	Internal Protector
LPS	—	Low-Pressure Switch
LR	—	Lockout Relay
LS	—	Limit Switch
MGV	—	Main Gas Valve
NEC	—	National Electrical Code
OAT	—	Outdoor-Air Thermostat
OFM	—	Outdoor-Fan Motor
QT	—	Quadruple Terminal
RS	—	Rollout Switch
RVS	—	Reversing Valve Solenoid
SEC	—	Secondary
TH	—	Thermostat-Heating
TRAN	—	Transformer

Field Splice

Marked Wire

Terminal (Marked)

Terminal (Unmarked)

Terminal Block

Splice

Splice (Marked)

Factory Wiring

Field Control Wiring

Field Power Wiring

Accessory or Optional Wiring

To Indicate Common Potential Only, Not to Represent Wiring

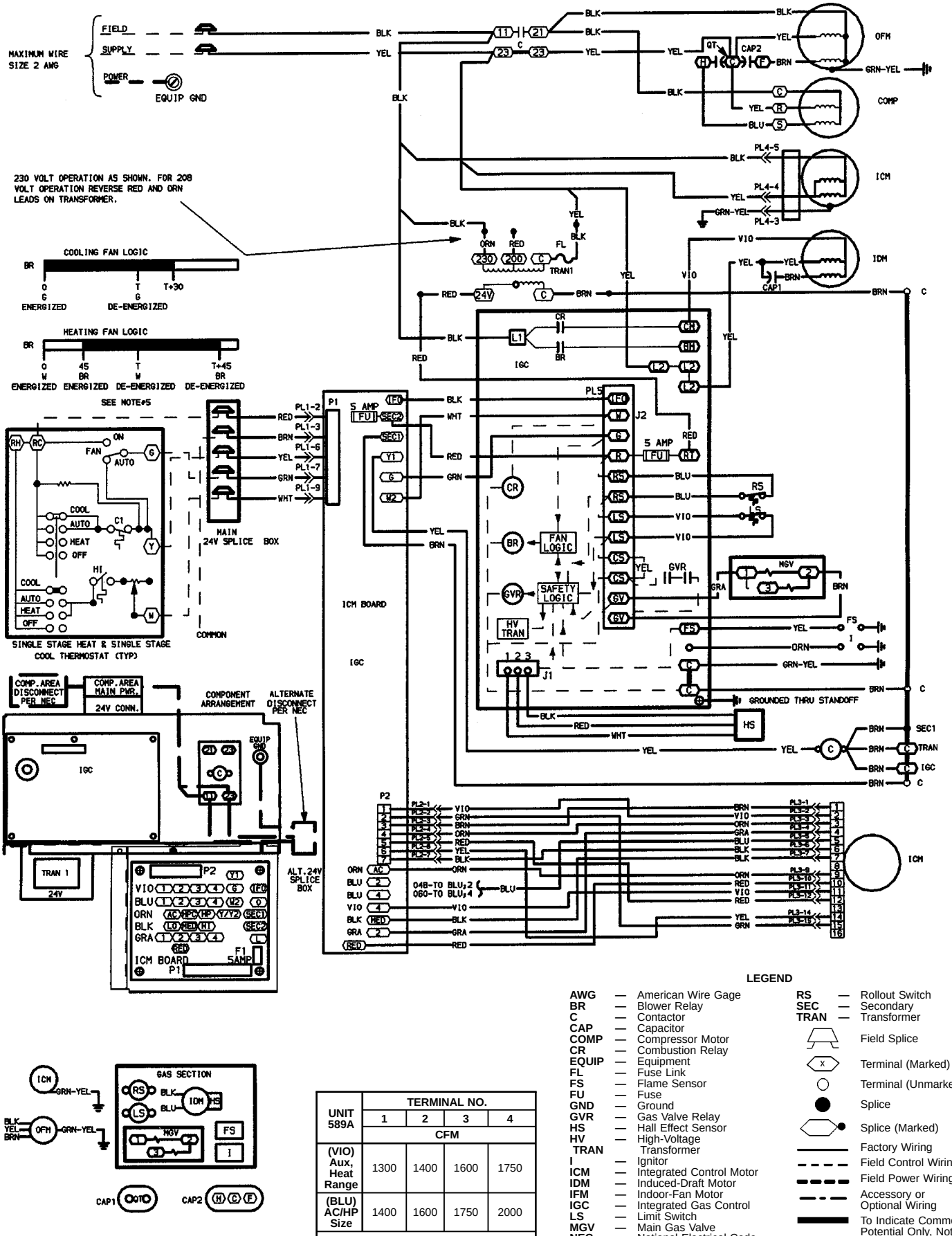
NOTES:
1. If any of the original wire furnished must be replaced, it must be replaced with type 90 C wire or its equivalent.
2. Set heat anticipator at .6.
3. Use copper conductors only.
4. ICM board connections.

UNIT 658A	TERMINAL NO.			
	1	2	3	4
	CFM			
(VIO) Aux, Heat Range	1300	1400	1600	1750
(BLU) AC/HP Size	1400	1600	1750	2000
(GRY) AC/HP Time Delay	30 sec. ON 1 min. OFF	0 sec. ON 0 sec. OFF	0 sec. ON 30 sec. OFF	0 sec. ON 45 sec. OFF

LED INDICATIONS

ERROR MODE	LED INDICATION
Normal Operation	ON
Hardware Failure	OFF
Fan ON/OFF Delay Modified	1 FLASH
Limit Switch Fault	2 FLASH
Flame Sense Fault	3 FLASH
5 Consecutive Limit Switch Faults	4 FLASH
Ignition Lockout Fault	5 FLASH
Inducer Switch Fault	6 FLASH
Rollout Switch Fault	7 FLASH
Internal Control Fault	8 FLASH

Fig. 6 — Wiring Diagram, Units 658A048,060; 208/230-3-60



UNIT 589A	TERMINAL NO. 1	2	3	4
	CFM			
(VIO) Aux, Heat Range	1300	1400	1600	1750
(BLU) AC/HP Size	1400	1600	1750	2000
(GRY) AC/HP Time Delay	30 sec. ON 1 min. OFF	0 sec. ON 0 sec. OFF	0 sec. ON 30 sec. OFF	0 sec. ON 45 sec. OFF

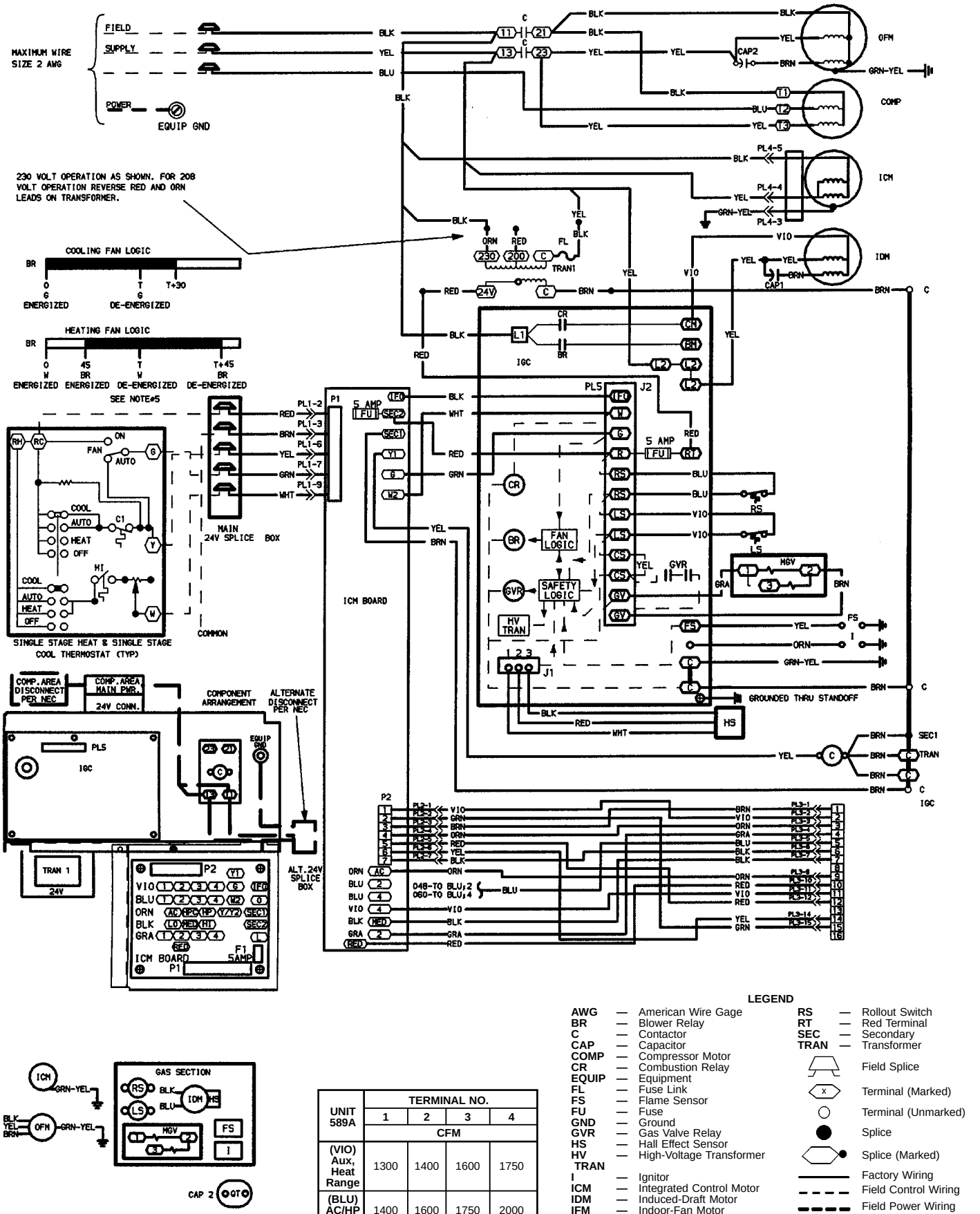
LEGEND

AWG	—	American Wire Gage
BR	—	Blower Relay
C	—	Contactor
CAP	—	Capacitor
COMP	—	Compressor Motor
CR	—	Combustion Relay
EQUIP	—	Equipment
FL	—	Fuse Link
FS	—	Flame Sensor
FU	—	Fuse
GND	—	Ground
GVR	—	Gas Valve Relay
HS	—	Hall Effect Sensor
HV	—	High-Voltage
TRAN		Transformer
I	—	Ignitor
ICM	—	Integrated Control Motor
IDM	—	Induced-Draft Motor
IFM	—	Indoor-Fan Motor
IGC	—	Integrated Gas Control
LS	—	Limit Switch
MGV	—	Main Gas Valve
NEC	—	National Electrical Code
OFM	—	Outdoor-Fan Motor
PWR	—	Power
QT	—	Quadruple Terminal
RS	—	Rollout Switch
SEC	—	Secondary
TRAN	—	Transformer

Field Splice
Terminal (Marked)
Terminal (Unmarked)
Splice
Splice (Marked)
Factory Wiring
Field Control Wiring
Field Power Wiring
Accessory or Optional Wiring
To Indicate Common Potential Only, Not to Represent Wiring

NOTES:
1. If any of the original wire furnished must be replaced, it must be replaced with type 90 C wire or its equivalent.
2. Use copper conductors only.
3. ICM board connections.

Fig. 7 — Wiring Diagram, Units 589A048,060; 208/230-1-60



UNIT 589A	TERMINAL NO.			
	1	2	3	4
	CFM			
(VIO) Aux, Heat Range	1300	1400	1600	1750
(BLU) AC/HP Size	1400	1600	1750	2000
(GRY) AC/HP Time Delay	30 sec. ON 1 min. OFF	0 sec. ON 0 min. OFF	0 sec. ON 30 sec. OFF	0 sec. ON 45 sec. OFF

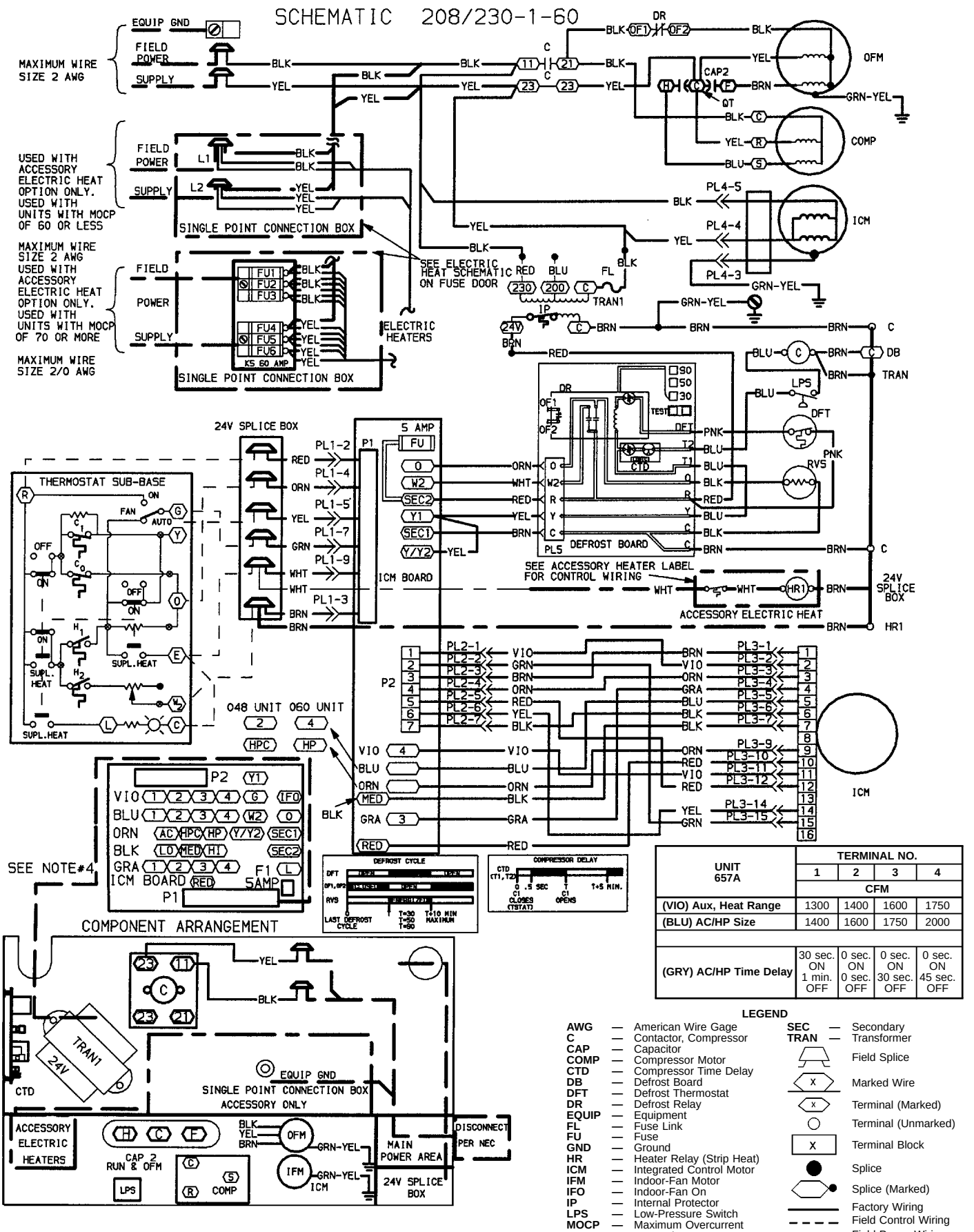
LEGEND

AWG	—	American Wire Gage
BR	—	Blower Relay
C	—	Contactor
CAP	—	Capacitor
COMP	—	Compressor Motor
CR	—	Combustion Relay
EQUIP	—	Equipment
FL	—	Fuse Link
FS	—	Flame Sensor
FU	—	Fuse
GND	—	Ground
GVR	—	Gas Valve Relay
HS	—	Hall Effect Sensor
HV TRAN	—	High-Voltage Transformer
I	—	Ignitor
ICM	—	Integrated Control Motor
IDM	—	Induced-Draft Motor
IFM	—	Indoor-Fan Motor
IGC	—	Integrated Gas Control
LS	—	Limit Switch
MGV	—	Main Gas Valve
NEC	—	National Electrical Code
OFM	—	Outdoor-Fan Motor
PWR	—	Power
QT	—	Quadruple Terminal
RS	—	Rollout Switch
RT	—	Red Terminal
SEC	—	Secondary
TRAN	—	Transformer

Field Splice
Terminal (Marked)
Terminal (Unmarked)
Splice
Splice (Marked)
Factory Wiring
Field Control Wiring
Field Power Wiring
Accessory or Optional Wiring
To Indicate Common Potential Only, Not to Represent Wiring

NOTES:
1. If any of the original wire furnished must be replaced, it must be replaced with type 90 C wire or its equivalent.
2. Use copper conductors only.
3. ICM board connections.

Fig. 8 — Wiring Diagram, Units 589A048,060; 208/230-3-60



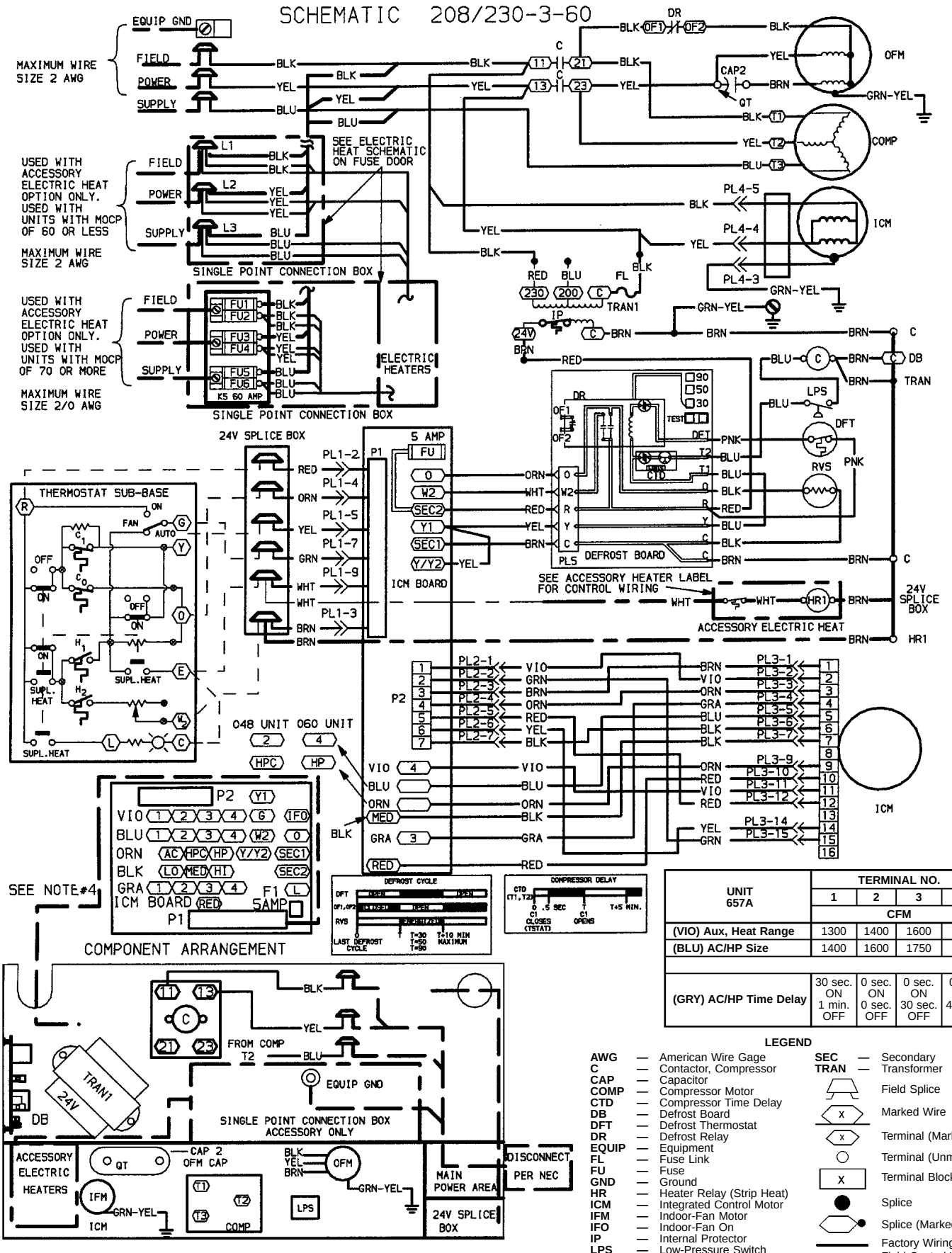
UNIT 657A	TERMINAL NO. 1	2	3	4
	CFM			
(VIO) Aux, Heat Range	1300	1400	1600	1750
(BLU) AC/HP Size	1400	1600	1750	2000
(GRY) AC/HP Time Delay	30 sec. ON 1 min. OFF	0 sec. ON 0 sec. OFF	0 sec. ON 30 sec. OFF	0 sec. ON 45 sec. OFF

LEGEND

AWG	— American Wire Gage	SEC	— Secondary
C	— Contactor, Compressor	TRAN	— Transformer
CAP	— Capacitor		Field Splice
COMP	— Compressor Motor		Marked Wire
CTD	— Compressor Time Delay		Terminal (Marked)
DB	— Defrost Board		Terminal (Unmarked)
DFT	— Defrost Thermostat		Terminal Block
DR	— Defrost Relay		Splice
EQUIP	— Equipment		Splice (Marked)
FL	— Fuse Link		Factory Wiring
FU	— Fuse		Field Control Wiring
GND	— Ground		Field Power Wiring
HR	— Heater Relay (Strip Heat)		Accessory or Optional Wiring
ICM	— Integrated Control Motor		To Indicate Common Potential Only, Not to Represent Wiring
IFM	— Indoor-Fan Motor		
IFO	— Indoor-Fan On		
IP	— Internal Protector		
LPS	— Low-Pressure Switch		
MOCP	— Maximum Overcurrent Protection		
NEC	— National Electrical Code		
OF	— Outdoor Fan		
OFM	— Outdoor-Fan Motor		
QT	— Quadruple Terminal		
RVS	— Reversing Valve Solenoid		

NOTES:
1. If any of the original wire furnished must be replaced, it must be replaced with type 90 C wire or its equivalent.
2. Set heat anticipator at .6.
3. Use copper conductors only.
4. For ICM board connections, see table.

Fig. 9 — Wiring Diagram, Units 657A048,060; 208/230-1-60



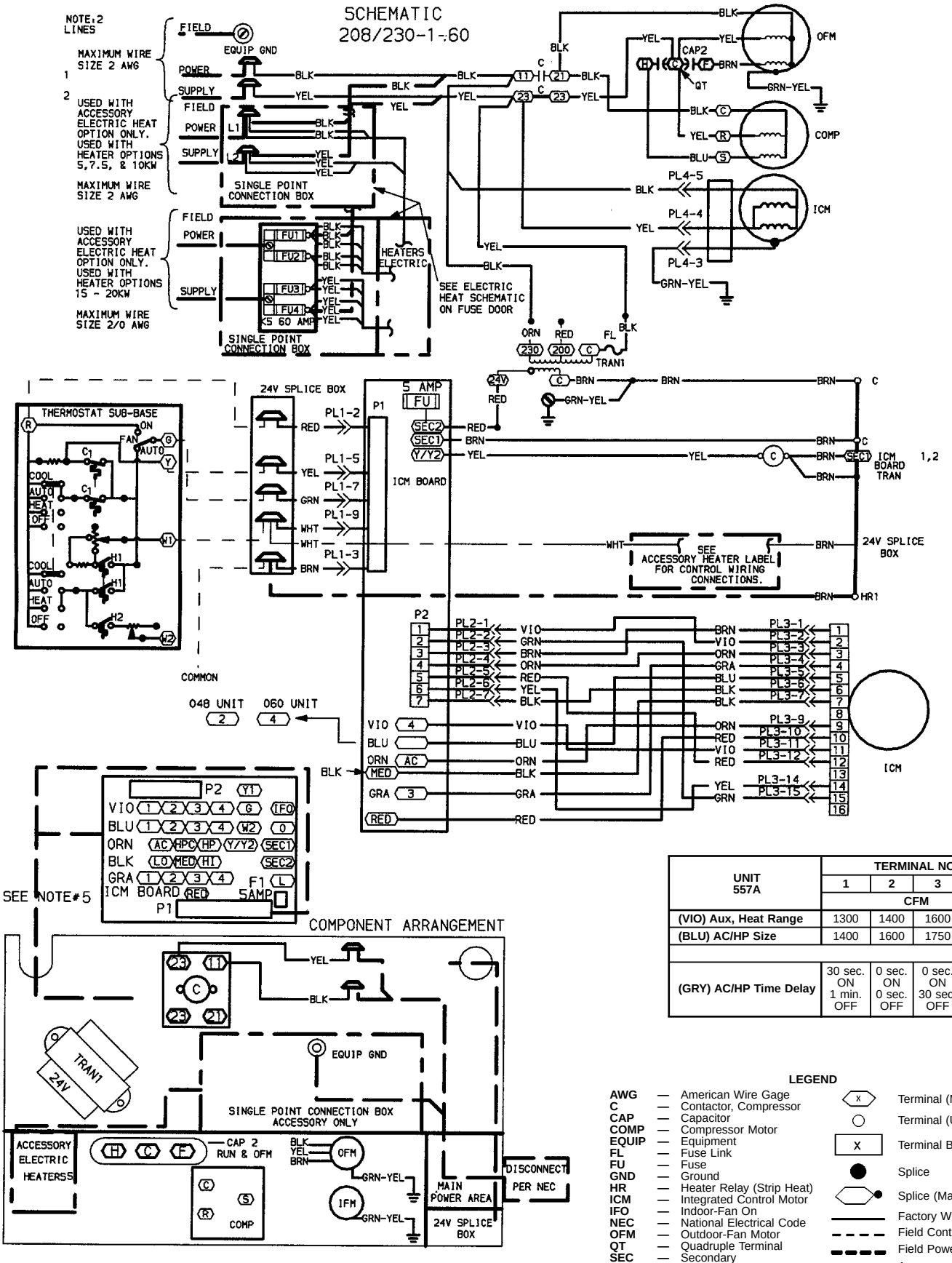
UNIT 657A	TERMINAL NO. 1	2	3	4
	CFM			
(VIO) Aux, Heat Range	1300	1400	1600	1750
(BLU) AC/HP Size	1400	1600	1750	2000
(GRY) AC/HP Time Delay	30 sec. ON 1 min. OFF	0 sec. ON 0 sec. OFF	0 sec. ON 30 sec. OFF	0 sec. ON 45 sec. OFF

LEGEND

AWG	— American Wire Gage	SEC	— Secondary
C	— Contactor, Compressor	TRAN	— Transformer
CAP	— Capacitor		Field Splice
COMP	— Compressor Motor		Marked Wire
CTD	— Compressor Time Delay		Terminal (Marked)
DB	— Defrost Board		Terminal (Unmarked)
DFT	— Defrost Thermostat		Terminal Block
DR	— Defrost Relay		Splice
EQUIP	— Equipment		Splice (Marked)
FL	— Fuse Link		Factory Wiring
FU	— Fuse		Field Control Wiring
GND	— Ground		Field Power Wiring
HR	— Heater Relay (Strip Heat)		Accessory or Optional Wiring
ICM	— Integrated Control Motor		To Indicate Common Potential Only, Not to Represent Wiring
IFM	— Indoor-Fan Motor		
IFO	— Indoor-Fan On		
IP	— Internal Protector		
LPS	— Low-Pressure Switch		
LS	— Limit Switch		
MOCP	— Maximum Overcurrent Protection		
NEC	— National Electrical Code		
OFM	— Outdoor-Fan Motor		
QT	— Quadruple Terminal		
RVS	— Reversing Valve Solenoid		

NOTES:
1. If any of the original wire furnished must be replaced, it must be replaced with type 90 C wire or its equivalent.
2. Set heat anticipator at .6.
3. Use copper conductors only.
4. For ICM board connections, see table.

Fig. 10 — Wiring Diagram, Units 657A048,060; 208/230-3-60



UNIT 557A	TERMINAL NO.			
	1	2	3	4
	CFM			
(VIO) Aux, Heat Range	1300	1400	1600	1750
(BLU) AC/HP Size	1400	1600	1750	2000
(GRY) AC/HP Time Delay	30 sec. ON 1 min. OFF	0 sec. ON 0 sec. OFF	0 sec. ON 30 sec. OFF	0 sec. ON 45 sec. OFF

LEGEND

AWG	—	American Wire Gage
C	—	Contactor, Compressor
CAP	—	Capacitor
COMP	—	Compressor Motor
EQUIP	—	Equipment
FL	—	Fuse Link
FU	—	Fuse
GND	—	Ground
HR	—	Heater Relay (Strip Heat)
ICM	—	Integrated Control Motor
IFO	—	Indoor-Fan On
NEC	—	National Electrical Code
OFM	—	Outdoor-Fan Motor
QT	—	Quadruple Terminal
SEC	—	Secondary
TRAN	—	Transformer

Field Splice

Marked Wire

Terminal (Marked)

Terminal (Unmarked)

Terminal Block

Splice

Splice (Marked)

Factory Wiring

Field Control Wiring

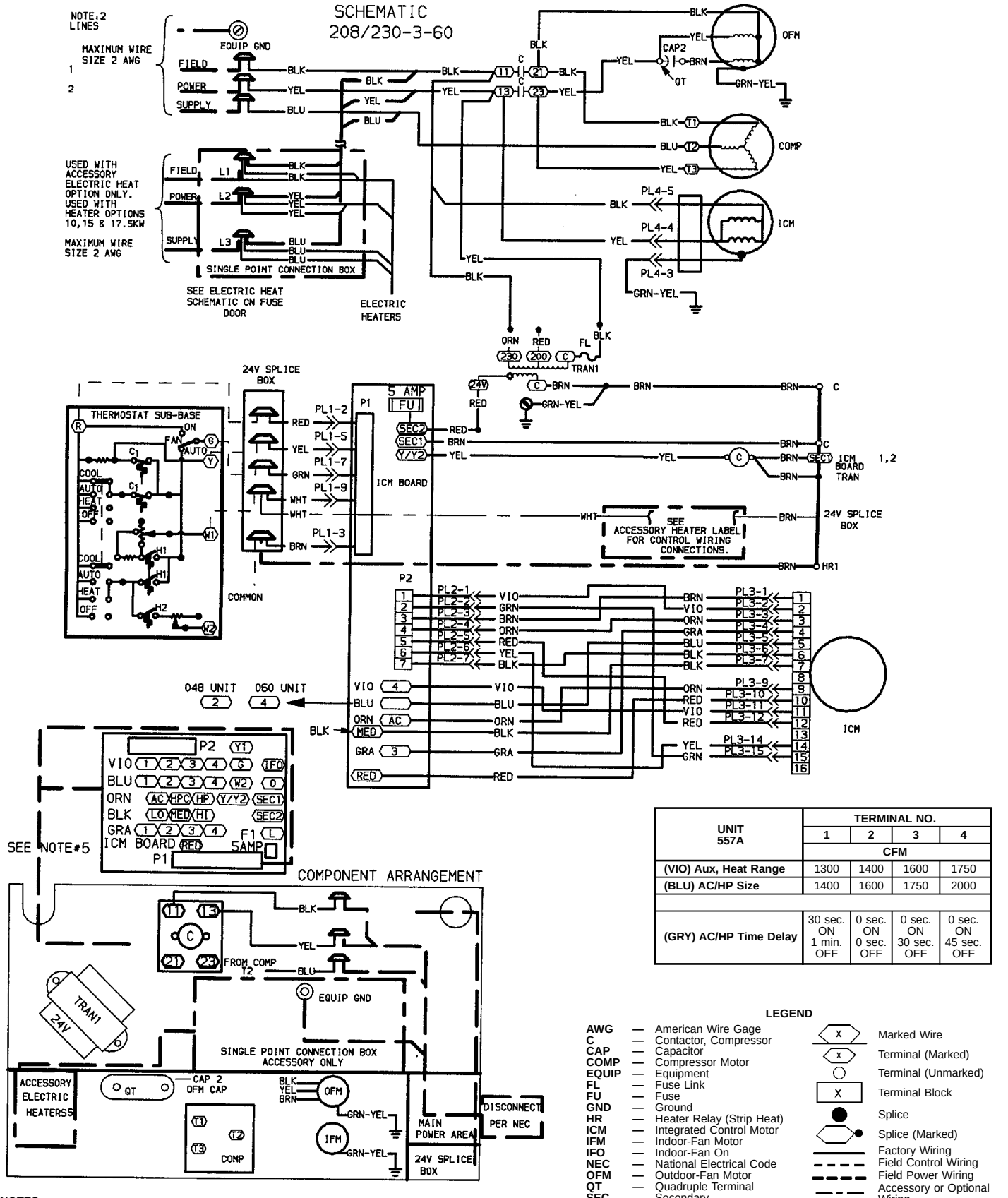
Field Power Wiring

Accessory or Optional Wiring

To Indicate Common Potential Only, Not to Represent Wiring

NOTES:
1. If any of the original wire furnished must be replaced, it must be replaced with type 90 C wire or its equivalent.
2. Number(s) indicates the line location of contacts. A bracket over (2) numbers signifies single pole double throw contacts. An underlined number signifies a normally closed contact. Plain numbers (no lines), signify a normally open contact.
3. Set heat anticipator at .6 amp for first stage and .3 amp for second stage.
4. Use copper conductors only.
5. For ICM board connections, see table.

Fig. 11 — Wiring Diagram, Units 557A048,060; 208/230-1-60



UNIT 557A	TERMINAL NO.			
	1	2	3	4
	CFM			
(VIO) Aux, Heat Range	1300	1400	1600	1750
(BLU) AC/HP Size	1400	1600	1750	2000
(GRY) AC/HP Time Delay	30 sec. ON 1 min. OFF	0 sec. ON 0 sec. OFF	0 sec. ON 30 sec. OFF	0 sec. ON 45 sec. OFF

LEGEND

AWG	—	American Wire Gage
C	—	Contactor, Compressor
CAP	—	Capacitor
COMP	—	Compressor Motor
EQUIP	—	Equipment
FL	—	Fuse Link
FU	—	Fuse
GND	—	Ground
HR	—	Heater Relay (Strip Heat)
ICM	—	Integrated Control Motor
IFM	—	Indoor-Fan Motor
IFO	—	Indoor-Fan On
NEC	—	National Electrical Code
OFM	—	Outdoor-Fan Motor
QT	—	Quadruple Terminal
SEC	—	Secondary
TRAN	—	Transformer
		Field Splice
		Marked Wire
		Terminal (Marked)
		Terminal (Unmarked)
		Terminal Block
		Splice
		Splice (Marked)
		Factory Wiring
		Field Control Wiring
		Field Power Wiring
		Accessory or Optional Wiring
		To Indicate Common Potential Only, Not to Represent Wiring

NOTES:
1. If any of the original wire furnished must be replaced, it must be replaced with type 90 C wire or its equivalent.
2. Number(s) indicates the line location of contacts. A bracket over (2) numbers signifies single pole double throw contacts. An underlined number signifies a normally closed contact. Plain numbers (no lines), signify a normally open contact.
3. Set heat anticipator at .6 amp for first stage and .3 amp for second stage.
4. Use copper conductors only.
5. For ICM board connections, see table.

Fig. 12 — Wiring Diagram, Units 557A048,060; 208/230-3-60

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